

Employability and Dental Caries Experience [†]

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Abstract: One of the most common oral diseases and a public health concern is dental caries. Risk assessment and health factor identification are necessary for prevention. Our research focuses on evaluating how dental caries experience is affected by employability. Radiological, oral, sociodemographic, and behavioral questionnaires were included in the investigation. Individuals who are unemployed display an increased occurrence of tooth decay. Regarding employability, the results showed a significantly lower experience in employed participants when compared to unemployed participants. Employability should be considered as a relevant health determinant of dental health.

Keywords: dental caries; public health; risk factor; employability

1. Introduction

Dental caries, affecting approximately 2.3 billion permanent dentitions worldwide, stands out as one of the most prevalent diseases. This condition is marked by a dysbiosis of the oral biofilm, primarily caused by fermentable carbohydrates [1]. As well as a lower perceived quality of life, dental caries are associated with considerable economic burdens [2]. Dental caries can result in eating difficulties, tooth loss, and toothache and may also lead to absence from school and work if not effectively managed [3,4]. Several groups within the population are at greater risk of dental caries, resulting in an unequal distribution of caries among the population [1]. The risk is increased by a number of factors, including cariogenic bacteria, cariogenic diets, oral hygiene habits, dental anxiety, socioeconomic status, education level, smoking habits, and others [5]. Gaining a thorough comprehension of these factors at the population level is imperative for devising effective oral health promotion strategies and policies [6]. Providing aggregated data on caries experience and factors related to it [7,8], a retrospective analysis was performed of a cohort of initial dental visits to a renowned Portuguese university hospital. Our primary objective was to assess caries experience and employability within the study population.

2. Materials and Methods

2.1. Sample Size, Study Design, and Setting

A secondary analysis of initial patient visits to a university dental clinic, specifically the Egas Moniz Dental Clinic in Almada, Portugal, is presented in this study. Data were collected for this study from an ongoing database of first-time patients that began on 1 January 2016 and was completed on 13 March 2020 using a nonprobability sampling approach. The initial appointments encompassed a thorough process, incorporating a self-reported health questionnaire, a comprehensive clinical examination of the entire mouth, and radiographic evaluations (including panoramic X-rays and/or bitewings). In addition, this study collected data on age, sex, education level, employment status, general medical history, medications used, smoking habits, and oral hygiene practices via self-reported questionnaire. A dental student observed the participants during the examination, and



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a qualified clinical assistant verified the final diagnosis. Patients were informed about their condition and treatment plan. This study required patients to give written consent, to be willing to participate, and to be 18 or older to be eligible. Patients with incomplete data or edentulous teeth were excluded. Due to the possibility of dental caries causing edentulism, it was excluded from this study. A higher prevalence of periodontitis has been reported in the observed population [9], which could result in an overestimation of dental caries, especially in the missing teeth component. This study did not include patients with disabilities or special needs since they are managed by the Egas Moniz Dental Clinic's Special Needs Department.

2.2. Dependent Variables

We employed a dichotomous variable (present or absent) to assess caries experience. Additionally, we utilized the DMF index as a continuous variable since it is the most used index for dental caries.

2.3. Independent Variables

Self-reported questionnaires were used to collect sociodemographic and behavioral information. Age, sex, education level, and occupation are important independent variables for determining health determinants and sociodemographic factors. Caries are predicted using several of these variables [10]. Males and females were divided into two groups by gender. The subjects were divided into four age groups based on their age: 18–24, 25–44, 45–64, and 65+. Regarding occupation, subjects were categorized into four categories: student, employed, unemployed, and retired.

2.4. Statistical Analysis

The data analysis was conducted using IBM SPSS Statistics version 28.0 for Windows (IBM Corp., Armonk, NY, USA). An analysis of the collected data was conducted using the Kruskal–Wallis test, a non-parametric statistical test, followed by an analysis of the pairwise differences using the Bonferroni test as a post hoc analysis.

3. Results

Participant Inclusion and Characteristics

The 9860 incoming patients met the eligibility criteria in 9349 (94.8%) cases, while 511 were excluded. In total, 36 (59.9%) of those excluded were younger than 18, 204 (39.9%) were edentulous, and 1 (0.2%) had an incomplete triage questionnaire. Among the 9349 participants, 59.8% were females, and 64.3% were aged 25 to 64, according to Table 1. In terms of occupation, the majority, 53.3%, were employed, with a smaller proportion of 11.6% unemployed, while 35.2% were either students or retired.

Table 1. Participant sociodemographic characterization (n = 9349).

Variable	Sub-Variable	n (%)
Gender	Female	5592 (59.8%)
	Male	3757 (40.2%)
Group by age (years)	18 to 24	1867 (20.0%)
	25 to 44	2907 (31.1%)
	45 to 64	3101 (33.2%)
	≥65	1474 (15.8%)
Occupation	Student	1616 (17.3%)
	Employed	4980 (53.3%)
	Unemployed	1083 (11.6%)
	Retired	1670 (17.9%)

This study involved a total of 9349 individuals, out of which 8521 (91.1%) reported dental caries experience. Table 2 reveals that unemployed individuals exhibited a statisti-

cally significant increase in both decayed teeth and missing teeth ($p < 0.001$) in comparison to their employed counterparts. The study findings indicate that the mean number of filled teeth was significantly higher among employed individuals compared to their unemployed counterparts.

Table 2. Dental caries and sociodemographic, health, and behavioral factors (n = 8521).

Variable	Sub-Variable	n (%)	Decayed	Missing	Filled	DMFT Mean
Gender	Female	5090 (59.7%)	5.8 (4.3) ^a	6.6 (7.4) ^a	3.3 (3.6) ^a	15.7 (8.2) ^a
	Male	3431 (40.3%)	6.3 (4.8) ^b	6.5 (7.4) ^a	2.7 (3.3) ^b	15.5 (8.2) ^a
Group by age (in years)	18 to 24	1496 (17.6%)	4.6 (4.5) ^a	0.7 (1.5) ^a	1.9 (2.6) ^a	7.3 (6.3) ^a
	25 to 44	2702 (31.7%)	6.9 (4.9) ^b	3.5 (4.5) ^b	3.6 (3.7) ^b	14.1 (7.0) ^b
	45 to 64	2932 (34.4%)	6.2 (4.1) ^c	9.4 (7.2) ^c	3.7 (3.8) ^c	19.2 (6.7) ^c
	≥65	1391 (16.3%)	5.5 (4.1) ^d	13.9 (7.9) ^d	2.1 (2.8) ^a	21.5 (7.0) ^d
Occupation	Student	1255 (14.7%)	4.1 (4.2) ^a	0.9 (2.2) ^a	2.2 (2.8) ^a	7.2 (5.5) ^a
	Employed	4661 (54.7%)	6.4 (4.5) ^b	5.7 (6.2) ^b	3.7 (3.8) ^b	15.8 (7.3) ^b
	Unemployed	1024 (12.0%)	7.4 (5.1) ^c	8.3 (7.9) ^c	2.7 (3.4) ^b	18.4 (7.5) ^c
	Retired	1581 (18.6%)	5.6 (4.1) ^d	13.4 (8.0) ^d	2.2 (2.8) ^a	21.2 (7.1) ^d

Data are mean (standard deviation). Different letters indicate statistically different mean values (Bonferroni, $p < 0.05$). Abbreviations: DMFT: Decayed, Missing, Filled Teeth index; n—number of participants. Statistical analysis for a significance level $p < 0.05$.

4. Discussion

This study highlights a high incidence of dental caries in the population. Among the participants, 91.1% had at least one tooth affected by dental caries, emphasizing its widespread prevalence globally [1,11]. The results might concern both the population in the Portuguese capital and those in less developed rural areas. Further epidemiological studies can aid the government in devising improved oral health policies [12].

Occupation is a significant variable. Unemployed participants showed higher dental caries rates, consistent with previous studies suggesting poorer oral health among the unemployed. Occupational settings can influence oral health, and socioeconomic status based on occupation is a common variable in epidemiological studies. Workplace stress, healthcare policies, and health insurance can affect oral health in older adults [13].

There are several potential explanations for how unemployment can affect oral health. One possibility is that dental treatment costs can be high even for those who are employed, and in certain countries, access to public dental care is limited or practically nonexistent [13,14].

Dental caries is a dangerous disease, but due to its risks and dynamic nature, more epidemiological research is needed to understand how it affects Portugal's population.

5. Conclusions

The incidence of caries in this population was quite high, and the existence of this condition was found to be significantly linked with occupation. In understanding dental caries, variables and determinants must be understood; however, behavioral and cognitive biases must be considered as well. These data could be utilized to prepare comprehensive epidemiological research and public health interventions in the future.

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References

1. Fontana, M.; Gonzalez-Cabezas, C. Evidence-Based Dentistry Caries Risk Assessment and Disease Management. *Dent. Clin. N. Am.* **2019**, *63*, 119–128. [[CrossRef](#)] [[PubMed](#)]
2. Peres, M.A.; Macpherson, L.M.; Weyant, R.J.; Daly, B.; Venturelli, R.; Mathur, M.R.; Listl, S.; Celeste, R.K.; Guarnizo-Herreño, C.C.; Kearns, C.; et al. Oral diseases: A global public health challenge. *Lancet* **2019**, *394*, 249–260. [[CrossRef](#)]
3. Bogale, B.; Engida, F.; Hanlon, C.; Prince, M.J.; Gallagher, J.E. Dental caries experience and associated factors in adults: A cross-sectional community survey within Ethiopia. *BMC Public Health* **2021**, *21*, 180. [[CrossRef](#)]
4. Frencken, J.E.; Sharma, P.; Stenhouse, L.; Green, D.; Laverty, D.; Dietrich, T. Global epidemiology of dental caries and severe periodontitis—A comprehensive review. *J. Clin. Periodontol.* **2017**, *44* (Suppl. 18), S94–S105. [[CrossRef](#)]
5. Smith, J.; Griffiths, K.; Judd, J.; Crawford, G.; D’Antoine, H.; Fisher, M.; Bainbridge, R.; Harris, P. Ten years on from the World Health Organization Commission of Social Determinants of Health: Progress or procrastination? *Health Promot. J. Aust.* **2018**, *29*, 3–7. [[CrossRef](#)]
6. Hujuel, P.P.; Hujuel, M.L.A.; Kotsakis, G. Personal oral hygiene and dental caries: A systematic review of randomised controlled trials. *Gerodontology* **2018**, *35*, 282–289. [[CrossRef](#)]
7. Zewdu, T.; Abu, D.; Agajie, M.; Sahilu, T. Dental caries and associated factors in Ethiopia: Systematic review and meta-analysis. *Environ. Health Prev. Med.* **2021**, *26*, 21. [[CrossRef](#)]
8. Fraihat, N.; Madae’en, S.; Bencze, Z.; Herczeg, A.; Varga, O. Clinical Effectiveness and Cost-Effectiveness of Oral-Health Promotion in Dental Caries Prevention among Children: Systematic Review and Meta-Analysis. *Int. J. Environ. Res. Public Health* **2019**, *16*, 2668. [[CrossRef](#)] [[PubMed](#)]
9. Botelho, J.; Machado, V.; Proença, L.; Alves, R.; Cavacas, M.A.; Amaro, L.; Mendes, J.J. Study of Periodontal Health in Almada-Seixal (SoPHiAS): A cross-sectional study in the Lisbon Metropolitan Area. *Sci. Rep.* **2019**, *9*, 15538. [[CrossRef](#)] [[PubMed](#)]
10. Yassin, S.; Tikare, S.; AlKahtani, Z.; AlFaifi, F.; AlFaifi, W.S.; AlFaifi, E.; Omair, A.; Ravi, K. Caries preventive practices and dental caries among boys aged 6–15 in Saudi Arabia. *Sci. Rep.* **2020**, *21*, 97–102. [[CrossRef](#)]
11. Lukacs, J.R.; Largaespada, L.L. Explaining sex differences in dental caries prevalence: Saliva, hormones, and “life-history” etiologies. *Am. J. Hum. Biol.* **2006**, *18*, 540–555. [[CrossRef](#)]
12. Guerreiro, E.; Botelho, J.; Machado, V.; Proença, L.; Mendes, J.J.; Manso, A.C. Caries Experience and Risk Indicators in a Portuguese Population: A Cross-Sectional Study. *Int. J. Environ. Res. Public Health* **2023**, *20*, 2511. [[CrossRef](#)]
13. Nobre, M.A.d.A.; Sezinando, A.M.; Fernandes, I.C.; Araújo, A.C. Influence of Smoking Habits on the Prevalence of Dental Caries: A Register-Based Cohort Study. *Eur. J. Dent.* **2021**, *15*, 714–719. [[CrossRef](#)]
14. Fattah, M.A.A.; Barghouth, M.H.; Wassel, M.O.; Deraz, O.H.; Khalil, A.E.; Sarsik, H.M.; Mohsen, A.M.A.; Qenawy, A.S.; El Fadl, R.K.A. Epidemiology of dental caries in permanent dentition: Evidence from a population-based survey in Egypt. *BMC Public Health* **2022**, *22*, 2438. [[CrossRef](#)]

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